Notebook, N-87-12-19

This notebook covers the period December 1887-March 1888. It was used primarily by Arthur E. Kennelly, but also by Robert T. Lozier and other unidentified experimenters, as a rough record book in the Galvanometer Room. The book contains notes, drawings, tables, and calculations regarding magnetic induction and electromagnets. There are also tests of meters, dynamos, and batteries for phonograph motors. Near the beginning of the book is a 5-page list of the equipment that was used to outfit the Galvanometer Room. The front cover is labeled "Rough Record Galvanometer Room No. I." The pages are unnumbered. Approximately 160 pages have been used.

Only the entries prior to January 19, 1888 have been filmed. Transcriptions of subsequent entries can be found in N-88-01-19.

(XE-172) N-87-12-19

~~7~~

8 C

9 V:

10 6

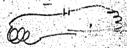
11

19th December. 87

50w

+ 52.5
55.0
107.8

tan 53.75 = 1.3638



36.5
35
2) 71.5
35.75

.7199
.8439

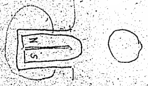
$$\frac{.7199 \times 100 - 1.3638 \times 50}{.8439} - 1.5$$

$$\frac{71.99 - 68.19}{.8439} - 1.5$$

$$\frac{3.8}{.8439} = 4.5 \quad - 1.5$$

8439) 38000 (4.5
42530
335

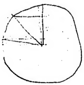
3w



1 cell	20w	+ 47°	A	− ~~4~~8
	40w	+ 30°		−31
	60w	+ 21.5°	~~10~~	−21.5°
no 2 cell	60w	+ 22.5		20
	40w	+ 31		29
	20w	+ 46.5		49
No 3 cell	60w	23		21
	40w	29		29
	20	47		48

50	54
60	50.5
100	33
120	30

sin 90 = 1
cos 90 = 0



tan 0 = 0
tan 45 = 1
tan 90 = ∞

---

no 1 cell 20w 47.50 tan 1.0913
40w 30.50 " .5890

$$\frac{40 \times .5890 - 20 \times 1.0913}{.5023} - 1.5$$

$$\frac{23.56 - 21.83}{.50.23} = \frac{1.73}{.5023} = 3.44$$

3.44
1.5
1.94w

5023) 1730(0344
22310
22180
2088

20w 47.5° tan 1.0913
60w 21.5° " .3939

$$\frac{60 \times .3939 - 20 \times 1.0913}{.6974} - 1.5$$

23.634 − 21.826

23.634
21.826
6974) 18080(259 − 1.5 = 1.09w
41320
64500

40w 30.5° tan 0.5890
60w 21.5 " 0.3939

$$\frac{60 \times .3939 - 40 \times .5890}{.1951}$$

23.634 − 23.56

23.634
23.560
.074
1951

.19

Negative result

No. 2. cell

60 w 21.25° tan 0.3889
40 w 30° - 0.5774
·1885

60 × ·3889 − 40 × ·5774
23.334 − 23.096
23.096
1885) ·238 0 (1.26
4950
11800

Result Negative

60 w 21.25 tan 0.3889
20 w 47.75 1.1009
·7120

60 × 0.3889 − 20 × 0.1009 − 1.5
·7120

23.334
20.018
7120) 3.3160 (4.66 − 1.5 = 3.16 w
468
42

40 w = 30° tan 0.5774
− 20 w = 47.75° 1.1009
·5235

40 × 0.5774 − 20 × 1.1009
·5235

23.096 − 22.018
22.018
5235) 1.0780 (2.06 − 1.5 = 0.56 w
31006

No 3 cell 60 w 22° tan 0.4040
40 w 29° − 0.5543
0.1503

60 × 0.4040 − 40 × ·5543 − 1.5
·1503

24.240 − 22.172
22.172
1503) 2.068 (13.8 − 1.5 = 12.3 w
5650
11480

60 w 22° tan 0.4040
20 w 47.5° 1.0913
·6873

60 × ·4040 − 20 × 1.0913 − 1.5
·6873

24.240 − 21.826 = 2.414 − 1.5
·6873 ·6873

6873) 24140 (3.51 − 1.5 = 2 w
35210
8350

40 w = 29° tan ·5543
20 w − 47.5 − 1.0913
·5370

40 × 0.5543 − 20 × 1.0913 − 1.5
·5370

22.172 − 21.826
21.826
5370) ·3460 (·64 ·64 − 1.5 = Negative
2380

3 cells together

50ω	54°	tan	1·3764
100ω	33		·6494
			·7270

100 × 0·6494 − 50 × 1·3764
64·94 − 68·82 Result Neg:
·7270

50ω	54°	tan	1·3764
60	50·5	-	1·2131
			·1633

60 × 1·2131 − 50 × 1·3764 — 1·65°
·1633
72·786
68·82
4·166
·1633

absurd

60ω =	50·5	tan	1·2131
120ω =	30	"	·5774
			·6357

120 × ·5774 − 60 × 1·2131
69288 − 72786 Neg

Finding all above results so false
Took one cell to Galvanometer room
+ tanα gilbor.

1 cell	50ω	26° +		24 −
	100ω	11·5° +		
	25ω	~~41°~~ +		42° −
	20ω	42° +		42·5 −
	10ω	59° +		62 −

~~100ω~~	− 12·25
50ω	− 18·5
25ω	− 20·25

100ω	− 13·5
50ω	− 24
25	− 34·5
20	44

44, 47, 44

Finding Small Galv co [illegible]

Test [illegible] [illegible] B one coil

100 w	20.5°		
10 w	57.5° +		
20 w	51° +		
40 w	38.50° +	·7954	
80 w	25° +	~~·1·4·5~~	·4663

$$\frac{80 \times 0.4663 - 40 \times {\cdot}7954}{{\cdot}3291}$$

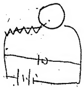
38.304
31.816
·3291) 6.488 (1.99
3.2970

40 × 0.7954 − 20 × 1.2349

31.816
24698
7.118
·4395

4395) 7.118 (1
2723

300
260.



Unit Pole attracts another unit pole at unit distance [shorthand] 1 dyne

[shorthand] 4π [shorthand]

[shorthand] M [shorthand] 4πM [shorthand]

Problem to find the percentage of arriving current in terms of transmitted current for different lengths of buried core whose res: is ·4 ω per knot & whose capy is 0·4 μf

Assume no res: in the sending battery. No res in receiving coil and retardation electrostatic only

Thus for 180 kts: of core

-6

log) 180 = 2·25527 ·275

180 = 2·25527

4 = 0·60206 1800

0·4 = $\bar{1}$·60206

0·02332 = $\bar{2}$·36773

$\bar{3}$·09239 = ·001209 = a

·00125 = $\bar{3}$·09691

0·01452 = antilog 1·034

Arriving current 0·017%

Constant

0·60206

$\bar{1}$·60206

$\bar{2}$·36773

$\bar{2}$·57185

$\bar{2}$·09691

0·47494

150 kts log 150 = 2·17609

2·17609

$\bar{2}$·57485

-4 $\bar{4}$·92403

a = ·00084 sec

$\bar{2}$·92403

$\bar{2}$·09691

0·82712 ~~6~~

2·17609

2·17609

0·60206

$\bar{1}$·60206

$\bar{2}$·36773

$\bar{4}$·92403

log ·00125 = $\bar{3}$·09691

·00084 = $\bar{4}$·92403

0·17288 = 1·489

= 0·476 %

---

100 kts

4·00000

$\bar{2}$·57185

-4 2·57185 ·000373 a

$\bar{3}$·09691

$\bar{4}$·57185 ~~3781~~

0·52506 3·350

16 %

---

50 Kts

1·69897

1·69897

$\bar{2}$·57185

-5 1·96979 ·000093 a

$\bar{3}$·09691

$\bar{5}$·96979

1·12712 = 13·40

90 %

10^6...

2·00000
$\bar{2}$·57185
−6 0̄·42885 = ·0000037

log ·00120 = $\bar{3}$·09691
$\bar{6}$·57185
2·52506 = 33520

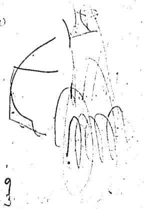
99%

1500

240 × 15 = 1200, 240 → 3600

3600 × 2·5 = 18000, 7200

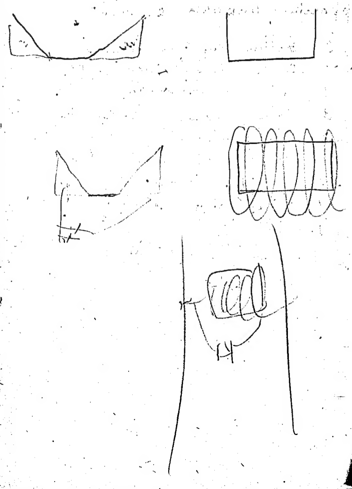
15 2·5



log 9200 = 3·96379
$\bar{2}$·36773
2·33152 −4·33152

·000216

1/1500 = ·0006



To arrive at the [illegible]

1 Rhumkoff coil, 1 machine [illegible]

Apparatus Unpacked 20.12.87

Locks		
Stowed in cupboard	3 1	Battery Keys on pillars
	3	Sir W. Thomson Discharge Key
	1	Trigger Discharge Key
	3	Double succession contact Keys
	2 (1)	Mercury Reversers.
2 Keys	2	Single coil galvanometer
2 Keys	2	Astatic double coil do. – 1 Shunt, 4 Spare coils
·	1	Single ring do tan:
1 Key	1	Gaugain
1 Key.	1	Sine tangent do.

1 Thomson Galv. [illegible]

1 " Quadrant Electrometer

mirror

mascart small electrometer

1 Obach Tangent galv.

1 Electro (Kohlrausch) dynamometer

1 small [illegible] do. with [illegible] scale

1 Radiophone

1 Siemens Electro Dynamometer

1 Elec. Mfg Co. Ring Tangent Galv.

1 " " " Gaugain " "

1 Siemens Ring "

with Tangent susp. & shunt

1 Darsonval Dead beat Galv. & Shunt

1 Siemens Universal Galv. & Shunt

1 Mercury reverser

1 German Aperiodic Galv.

Tony Thomson Galv. Shunt

1 Battery reversing key

Littmann capillary electrometer

Ayrton & Perry voltmeter

1 Falling key

1 Phonoscope

1 manometer

two selenium cells

magnetometer

21st December 1887

Case B 03084

1 Packet Price List

1 Universal Galv

1 Tan Sin do

1 Obach Galvr (glass cracked)

Case C 03284

1 Electro Dynamometer

1 Radiophone (2 flags bent) interrupters

1 Phosphoroscope

Case O JAW

1 Radiophone

1 Jamin Magnet 6

1 " 7

2 Photophones

2 Parabolic reflectors

1 Phosphoroscope

Case K JW 1 Quad Electom complete

Case G 1 Tachometer (Glass cracked)

Case J

2 Wall ammeters

1 Deadbeat Galvr

1 Magnetometer

2 Reading telescopes

1 Porcelain scale (1 Glass suspension tube broken)

1 Tan Galvr

1 Electr dynm.

Case P.

1 Cardew Voltmeter

1 A + P do

1 Thomson Photometer

1 Monckot App

1 Series 13 Resonators 10

1 Reis Thermometer (stalk broken)

1 Tambour for do.

1 Carcel lamp

1 Galvr.

1 Lippmann Electr (broken tube)

Case N

1 Thomson Electr

1 Darsonval Galvr.

1 Serie de Shunts

Case F 1 Tachograph

Glass back broken

also an oil feeder broken

Case Q.	1	Stand for Lippmann Elec
Case M 23. 12. 87	1	Ice Machine (Dropper badly bent 2 Decanters Broken 1 Bottle of oil broken)
	1	Extra zinc (bent)
	3	Decanters
Case D 23. 11. 87	1	Dynamo machine brushes + lubricator

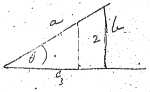
28th Dec. 87

Res. of two motor coils 0.28w each

Res. of Darsonval dead beat Galvr
by Univ. Galvr = 229.6w (59) 25.5
1/10 S. 26.2 (67.2)
58.8
67.8

1/100 S 3.62 (85)

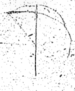
Res. of Thomson Galvr (Troy)
by S. U. G. 2627w (133)



$\frac{b}{c} = \tan\theta$

$\frac{2}{3}$ .666

$\frac{b}{a} = \sin\theta$

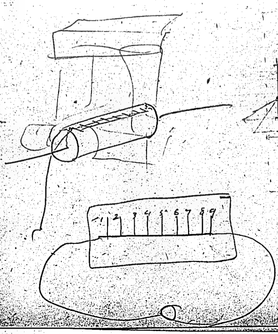


$\frac{150 + 58.8}{150 - 58.8} = \frac{208.8}{91.2}$ 91.2) 2088 (229 229 25.5

$\frac{150 + 67.8}{150 - 67.8} = \frac{217.8}{82.2}$ 82.2) 2178 (265 26.5

99) 229 (2

$\frac{235}{65} = \frac{47}{13}$



29 December 1887

Battery for Phonograph

Standard Daniel cell on

Electrometer -12 +11.6

~~Phonograph cell -2.1 + +1.7~~ (Bad)

~~Phonograph cell [illegible]~~

1 Phonograph cell - 1.78

1 " " + 1.9 unsteady

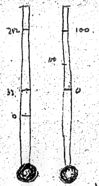
1 " " - 1.78

1 " " + 1.58

Standard Daniel Cell - 10.84
+ 11.01

Phonograph Cell - 1.7
+ 1.7

Battery on S.C. at 12.10 thro length of brass wire double its own res (1.75ω) = 3.5ω approx.

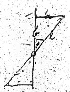


15°C $\frac{15 \times 9}{5} = 27 + 32 = 59$

C : 5 :: F : 9

10.84
11.01 } 10.925
1.4

10925) 17000 (1.56
6075
613



$a \times m \times H = b \times m \times F$

$F = \frac{aH}{b}$

$= H \times \frac{a}{b}$

$F_1 = H \times \tan\theta_1$

$F_2 = H \times \tan\theta_2$

20°

29th December 1887

Test of comparison of Phonograph Battery by Universal Galvanometer

Time 13.30

Standard Daniel 83.1° B

Phonograph Cell 102° A

14.25

Electrical Carbon (Bichromate) −19.6

Phonograph Cell −2.38

Phonograph " −

Standard Daniel −10.9

14.55

Short circuited through twice its resistance & left until

15.30

Potash cell (#2) −8.9

Balanced with piece of German silver wire 44" 0.0546

$$\frac{150-102}{150+83} = \frac{48}{233} = 0.206 \text{ Daniell}$$

109) 238 (.218 Daniell
200
910

109) 196 (1.8
87
1070

109) 890 (.817
180
71

.817 Daniell

.055 ω

Standard Daniell 83.B = 233
New KHO cell 61.5 = 211.5
falling to 49.5 = 199.5
46 = 196
" 36 = 186

Commenced at 0.907 Daniell
ended at 0.798 "

233) 211.5 (.907
1800
36

233) 199.5 (.856
1810
145

Res 0.043ω 233) 1860 (798
2290
193

36 44 144 144 158 94 253) 1580 (.62
620

Res. 0.016 Multiple arc
0.043ω Zinc + grid
0.131 Zinc + iron

0.6 Daniell

E.C. .600 / .032 × .6 .032) .60 (18.7 / 280 / 240 18.7 amperes
11.2 Watts

.032) .360 (11.2 / 40 / 8

.03

11.2 × 44.3
11.2
886
443
443
496.16 = 500

66
330

10.30 Dec 31/87

Resistance of Sliding Wire Bridge

on Siemens Universal 113.4° = .722 Ohms

Verified = .72 Ohms

11 O'clock

Standard Daniel B 97° = 2.47%

Phonograph cell = 140°

Res. 27 millimetres = 0.0260

12 O'clock Left on Short

circuit through 80 mm

taken off 12.45 = 146°

resistance = 25 m.m

Put on S.C. through 70 m.m

@ 12.by

247) 1400 (.567 Daniell at Noon 0.026
1650
1680

$\frac{27}{750}$ x .722
.27
5054
1444
750) 19494 (26
4494
744

271) 1460 (539 + 0.022 at 12.40
1050
2370

Time Continued

13.45 P. 150° } 0.543 R 25 mm
D. 276

15.05 P 150° } 0.555 R = 27 mm
D 270 1/2

16.30 ~~D. 258~~
P 198
D 290

·2125 for 70 cms
·02125 " 7
·00303 " 1 cm

1. Res 7 cms

---

1. 1. 88

13. D 255 } 0.50
P 120
Res 8 cms = 0.024

On S. C. Show 25 cms

Dec 31st 1887

Resistance of 700 C m

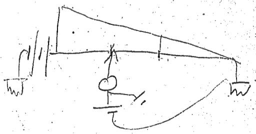
62.6° B = .243 Ohms
= 0.0243

$= \frac{.243}{700} = .000347$

3.1
347
1041
.010787

2. 1. 88

Daniell	264		
KHO	136	Res 25 cms =	0.075ω ?
working P pressure	110		



16..45 KHO cell 0.672 volts

Res abt 5 cms

In 10 mins fell from 0.34 to 0.16 volts
" 40 " " " to .076

5. 1. 88

Weights of plates in meter.

Meter 1

Left hand cell	L. A	88+ 420	= 88.420	
	R. h. B	-	= 85.750	2.67 A > B
Right - - -	L h A	"	= 85.540	3.48 A < B
	R h B	-	= 89.020	

Meter 2

Left hand cell	L A	= 87.83	1.92 A > B
	R B	= 85.91	
Right hand "	L A	= 83.28	3.00 B > A
	R B	= 86.28	

6. 1. 88

Lalandes cell Electr 59.2 −

40.7 +

18.5 9.25 = 50

Daniell 60.8

39.2

21.6 10.8 = 50

Internal Res of Lalande 59.

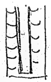
54.5

.0575 ~~77~~.5 cms

56.5

.0585 = 0.06 19.5 cms

.57



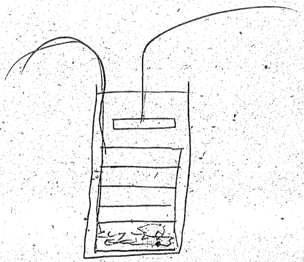
216) 18.50a856

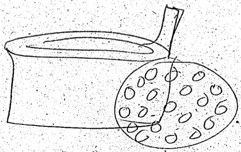
1220 856

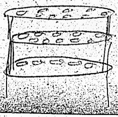
140.9416

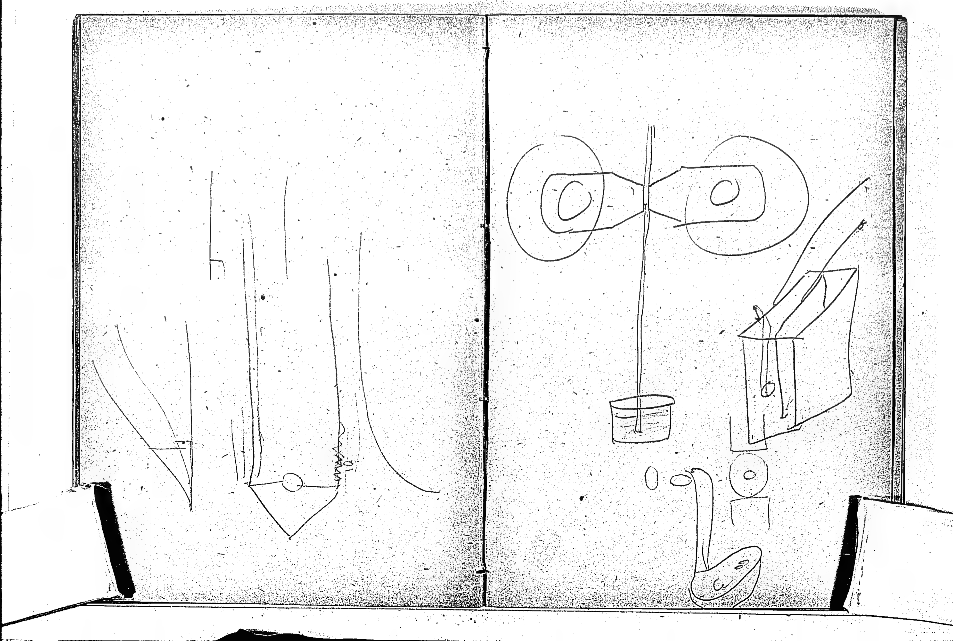
Reading of Aron's Clockwork Meter

17. 7. 1.88	—	07071
10. 8. 1.88	—	07075
8. 9. 1.88	—	07079









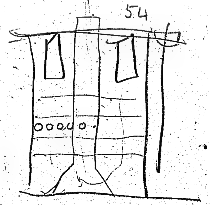
9. 1. 88

Daniell cell 60.7 Electr:
39.1
21.6 10.8

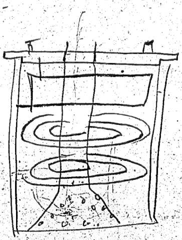
Lalande cell 38.52
Fe KHO Zn 61.3
22.8 11.4

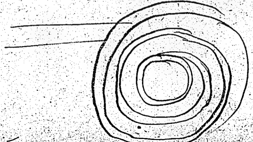
After S.ctng G lvg 54.5
44.5
56

15.40 Left on S.C. thro' abt its own res.
16.10 46
54



.21.6) 22.8 (1.056 1.056 Daniells
1200
120





16.2.2 after being left free 12 mins

44.9

55.0

after inserting metal spoon

55.3

Lippmann galv 39 / 14.5 1.2 + .9 −

14.5) 390 (26.89

.169 .1515 × 2970 × 975

3600) 4386.69 (1.218 ampere hours

Metre 07088 when lamps lit up

8.	10.1.88	07080
17.30	10.1.88	07167
8.10	11.1.88	07173
8.0	12.1.88	07287
15.45	12.1.88	07383
	13.1.88	07400
9.0	14.1.88	07506
	14.1.88	07599

136 | 166 30

166.586

.02/10 = .2/100 2/1000

400 × .15 × 2970 / 3600 2970 coil

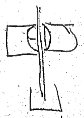
Comparison of Current metres

Lamps in cct	A	B	C	
6	2·85?	2·81	1·0 –	1·4 +
4	2·2	1·9	"	1·1 +
2	0·5	0·88		0·6 +
1	1·0	0·4		0·47
10	4·6	4·4	1·75 –	2·2 +

19) 11 (57
15

88) 600 (68
720
160

44



Tried capillary tubes containing
H_2O with aniline no perceptible res
$FeCl_2$ " " "
Fe_2Cl_6
$FeSO_4$
Pyrophoric iron

Coeff. Ohms per amp

5
5·7
6·8
10·
6·6

11 . 1 . 88

Obtained [illegible] 3mm [illegible] Fe_2Cl_6 [illegible]
[illegible] 5 ~~[illegible]~~ amp.

[illegible]

1 Fe_2Cl_6

2 FeS

3 FeCn

4 $FeSO_4$

5 Fe pyrophoric [illegible]

6 Fe K Cn

6·18 350 6·18

322 1 303 37
290 2 3 267
260·5 4 5 237·5
234·5 6 211
211 187
189·5 167

9·58 13 3·37

13)217(1·66
-87
90

644)681·5(1·0582
3750
5300
1480

$\frac{1}{20} \log_\varepsilon \frac{x_{1}}{x_{20}}$

$\log_\varepsilon \frac{681}{268·2}$ log 681 = 2·

19·1 353 681·5
2 324·5 2 644·5
3
4 316
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19 14·5
20
21 13·1

24·25
19·1
5·24

324
16·2 secs

137·2

12 . 1. 88

Experiment = 8.25

Potential of Le Lande without + with Oxide of copper

Le Lande 59.45 } Put on S 6 @ 8.25 (Without oxide)

" 40.45 } Taken off @ 10,20

Daniel 60. 3 21

39. 4

Reading after being S. 6 from 8.25 to 10.20

Le Lande 46.55 7.

" 53.5

With Copper Oxide S. 6 @ 10.20 taken off @ 11.20

Le Lande = 46.2 8

54.1

With Larger supply Cu O

46.3

53.7

Time Date

Experiment

Comparison of ammeters

928
52
1856
4640
48256

5)27(52
10 200

Electrodyn. 27 - 4.8256

H & B vertical am. ~~Long~~ range 4.6

- - - - ~~Short~~ range 4.2

	−	12. 1. 88	+	
x_1	325	59 19	312	x_1
		35		
x_2	293			
		53	281	x_3
x_4	263	0.10		
		28	253	x_5
		45		
x_6	238			
		1.2	228	x_7
x_8	214	20		
		36	205.5	x_9
		54		
x_{10}	193			
		2.11	185	x_{11}
x_{12}	175	28		
		45	167	x_{13}
x_{14}	153	3.3		
		20	157.5	x_{15}
x_{16}	143	37		
		55	136.5	x_{17}
x_{18}	128	4.12		
		29	123	x_{19}
x_{20}	117	45		
		5.3	111	x_{21}
x_{22}	105.5	20		
		37	101	x_{23}

2.718) 3120 (1.15
4020
13.02

$$\lambda = \frac{1}{20-1} \log_e \left(\frac{605}{228} \right)$$

log 605 = 2.7817554
228 = 2.3579348
0.4238206

log 0.4238 $\bar{1}$.6271814
log m = $\bar{1}$.6377843
$\bar{1}$.9893971 0.97588

19) 97588 (51362
25
68
118
40
= 0.051362

---

574) 605 (1.054
3100
2300
040

ρ = 1.054
log ρ = 0.0218406

0.02184 = $\bar{2}$.3392526
4343 = $\bar{1}$.6377843
$\bar{1}$.7014683 = .050288

$P_2 = \frac{1}{4}\left(8.59.19 + 2(8.59.35) + 8.59.53\right) - \frac{1}{4}\left(\frac{.054}{2.054}\right)^2 \left(8.59.19 - 2(8.59.35 + 8.59.53)\right)$

59.19
~~1~~59.10
59.53
2.38.22
59.34

22 vib — 9.5.37
8.59.19
6.18
22) 378 (17.19 secs.
158
40
180

Plates in contact with weight of upper 26,000

1. Kilog 3,800 ω
19 lbs, 23 ω.
38.5 – 3 ω

Date 12/1/88

Experiment –

Resis of Oxide of Copper ~~to~~
1/16" thick between two
copper plates 16 square inches
with 40 lb weight =
20,000,000 Ohms

38.5 lbs (weighed)
~~10~~s 100 sq. cms.
17,500 grammes on 100 sq cm
175 grammes per sq. cm.
.16 cms thick
2000 Ω per sq. cm.
12000 Ω – cubic cm.

453.5
385
22675
36280
13605
174597.5

.16) 254 (1.59
94
140 .16

With the ~~sheets~~ one sheet
Oxodized + one clean, ~~[illegible]~~ contact
by its own weight = 26.000 Ohms
One Kilogramme weight = 3.800 Ohms
19 lbs " = 23 "
38.5 " " = 3 ~~[illegible]~~ "

13.1.88.

La Lande +3.8
56.15

~~320~~ 15 320

309 25. 302

13/1/88

Resistance of Copper oxide Surface

Oxide plate resting by its own weight 2.9 Ohms

with One hectogram .5 "

" " Kilo " Less than .1 "

~~Copper plate~~

Tin foil resting on copper plate

with light piece of wood 7300. Ohms

" One hectogram 200 "

" Two " 10 "

" Five 1 "

" One kilo gram .4 "

" Five hectograms 1 "

" Two " 1.2 "

" One " .5 "

" Light piece of wood 5600 "

" out block of wood 60000 "

12. 1. 88

Plate of Cu $2\frac{7}{8}'' \times 2\frac{3}{4} \times .\frac{1}{4}''$ had one surface cleaned with HNO_3 and then oxydized by being heated over a Bunsen burner.

A slip of tinfoil clamped between two strips of Cu was then laid on the oxydized surface so as to expose 2.53" × 2.35". Above the tinfoil came a slip of Chamois leather of about the same dimensions + above the chamois leather a strip of wood $2\frac{1}{2} \times 2\frac{1}{2}$

3 Fuller cells 10 : 1000 $\left(\frac{10}{1000}\right)$ = 7000 = 700000
no weight

With 10 Grams = 1,000 = 100000
" 20 " = 700 = 70000
" 40 " = (100 : 1000 :: 3000) = 30000
" 80 " = (100 : 1000 :: 1800) = 18000
" 160 " = (1000 : 100 :: $2\frac{1}{2}$) = .25
" 80 " (1000 : 100 :: 3) = .3
" 40 " (1000 : 100 :: 3) = .3
" 20 " do .3
With its own weight do .55
Leads measure .2 Ohms

With plates disturbed + one Kilo gram = .25
" 13.20

With the copper plate cleaned and heavily re-oxidized the results were with its own weight (viz: Tin foil, chamois + wood block of)

10 : 1000 :: 2000 : 200000

One gram added – no change
Ten " " 10 : 1000 :: 1,100 : 110,000
20 " " 10 : 1000 :: 900 : 90,000
40 " " 100 : 1000 :: 5,200 : 52,000
80 " " 100 : 1000 :: 4,400 : 44,000
" " 100 : 1000 :: 2,050 : 20,500
160 1000 : 10 :: 110 % .1 1.1
320 " "
→ unsteady
Its own weight 100 : 1000 :: 6,000 : 60,000
1 Gram (no change) " " "
5 " 100 : 1,000 :: 5000 : 50,000
10 " the same
20 " ——— 100 : 1000 :: 4000 : 40,000
40 " ——— 100 : 1000 :: 3,450 : 34,500
60 " ——— 100 : 1000 :: 2,000 : 20,000
80 " ——— 100 : 1000 :: 1,700 : 17,000

—— continued ——

100 Grams added (weights lifted off to adjust) = 100 : 1000 :: 1800 : 18,000

120 Grams added 100 : 1000 :: 1450 : 14,500

140 " " 1000 : 100 :: 50 : 5

130 " " 1000 : 100 :: 40 : 4

→ unsteady

120 Grams " 1000 : 100 :: 87 : 8.7

110 " " 1000 : 100 :: 110 : 11

→ unsteady

100 Grams " 1000 : 100 :: 110 : 11

90 " " 1000 : 100 :: 140 : 14

→ variable

80 Grams " 1000 : 100 :: 80 : 8

→ very variable

70 Grams " 1000 : 100 :: 150 : 15

→ very variable

60 Grams " 1000 : 100 :: 100 : 10

→ very variable

50 Grams " 1000 : 1000 :: 20 : 20

—— continued ——

40 Grams added 1000 : 1000 :: 20 : 20

30 " " " " " "

20 " " 700 : " " " 6000 : 6,000

10 " " 100 : 1000 :: 6000 : 60,000

Its own weight same thing

minus " of wood

Weight of wood + chamois

8.6 Grams

Resistance of leads .2 Ohms

Surface

.73
.7
.57

2.75
2.53
1100
1375
5550
6.7850

2.4
2.54
96
120
48
6.096

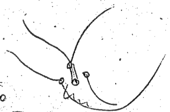
2.875
2.53
11500
14375
5750
7.30250

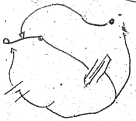
.125

2.5
2.54
100
125
50
63.50
6.1
635
3810
38.735

16. 1. 88

Meter No 1	1	A	88.34	88.34	174.31
		B	86. – .033 =	85.97	
	2	A	85.5 – .06 =	85.44	174.735
		B	89.30 – .005 =	89.295	
Meter no 2	1	A	87.80 – .05 =	87.75	173.92
		B	86.2 – .03 =	86.17	
	2	A	83.3 – .07 =	83.23	169.77
		B	86.6 – .06 =	86.54	





			ory	
174.170	= .14	2.37 A > B	2.67 > B	.30
174.560	= .175	3.855 B > A	3.48 > B	.363
173.74	= .18	1.58 A > B	1.92 > B	.34
169.56	= .21	3.31 B > A	3.00	.31
	4) .705			1.313
	.176			.328

Mean transference of .1515 grammes of Zinc

~~Constant~~

.1515 × 400 = 60.60 grammes

1 coulomb transfers .0003367 grammes

3367) 6060 (18
26930
26936
994

3.367×10^{-4}

$\frac{60}{3 \times 10^{-4}}$ 20,0000

180,000

$\frac{60.6}{.0003} = \frac{606}{.003}$ $\frac{6060}{.03}$ $\frac{60600}{.3}$ $\frac{606000}{3}$

$\frac{.025}{1000}$

180,000 coulombs,

3600) 180,000 (50 ampere hours.

$\frac{1}{3000}$

60.60
2970
178200

180,000 coulombs
50 ampere hours

16 - 1 - 88

Resis of Edison current meter (#2) = ·17 Ohms (including leads)

Shunt + leads = ·176 Ohms

Resis 1 Cell (#1) = ~~2.07~~ 1.88 "

" " (#2) 2.20

Resis of Leads ·155

·176
·155
·021 ω

1.88
2.20
4.08
2.04

·021 / 2.061 = 1/100 th

stamps
8-12-9
1-6

2061) 2100 (1.019

0.037	155	·192	strip + leads / Res. + leads. Left
7.935		8.09	
8.035		8.19	Rt.
0.026		·181	Strip + leads

Res of bottle 20

·025 ·180
8.12

Shunt ·176 − ·155 (leads) = ·021

2nd cell 2.20 − ·155 = 2.045
1st 1.88 − ·155 = 1.725
3.770
1.885

Fractional current traversing meter

$$\frac{\cdot 021}{1.885 + \cdot 021} = \frac{\cdot 021}{1.906} = \frac{\cdot 21}{19.06}$$

$\frac{2.1}{1906} = \frac{1}{95}$ about

21) 1906 (90.76

Coefficient = 90.76

$\frac{\cdot 026}{10.061} = \frac{\cdot 26}{100} = \frac{2.6}{1000}$

·037

$\frac{\cdot 025}{10} = \frac{\cdot 25}{100}$ $\frac{2.5}{1000}$ $\frac{1}{400}$

$\frac{1}{400}$ th part of the traversing current

975 th part

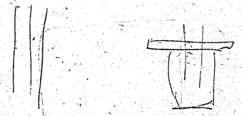
= 147.7 gr 12/146223
121.85

Ehrens Meter 07704

17. 16. 1. 88

Comparison of Hartmann & Braun's Rheostat with Troy bridge

H. Box	4000	3 Fullers $\frac{1000}{1000}$	4000 + 10 + 5 + 2 + 1	= 4018
	3000		3000 + 2 + 2	= 3004
	2000		2000 + 2 + 2	= 2004
	1000		1000 + 1	= 1001
	400		400 + 1	= 401
	300	$\frac{1000}{100}$	3000 + 9	= 300.9
	200		2000 + 7	= 200.7
	100		1000 + 5	= 100.5
	40 + 30 + 20 + 10		1000 + 3	= 100.3
	40 + 30 + 20 + 4 + 3 + 2 + 1		ditto	
	4000	$\frac{1000}{1000}$	4000 + 10 + 5 + 2 over	= 4017.5



Resis Copper Oxide
17 - 1 - 88

Oxide derived from heating sheet copper & scraping off oxidized deposit with a knife this was pulverized & put in carbon box of telephone between two platinum discs & the results were with :—

no extra weight, 10 : 1000 :: 100000 : 10,000,000 Ohms

10 Grams 10 : 1000 :: 50,000 : 5,000,000 Ohms

20 " do.

120 " do

When pressed down with finger hard 10 : 1000 :: 10000 : 1,000000 Ohms

With thumb pressure very hard

= 10 : 1000 :: 2,200 : 220,000 "

---

19 - 1 - 88

Small disc was oxidized & ~~[illegible]~~ imbedded in a cake of paraffine exposing a surface of about a cubic c.m. on this was poured mercury to the depth of about 3/8 of an inch

— Continued —
"

Res. taken = 21 ohms
After 3 minutes = 2.6 "
" 6 " = 2.1 "
" 15 " = .2 "

Comparison of Mr Seubel's bridge with ours of Troy

100 ω coil	100.4 ω .1	= 100.3 ω
10 ω	∞	∞
1 ω	1.105 − .0095	= 1.010

Leads 9.5 ÷ 100 = .0095

Separate $\frac{1014}{100}$ = 10.14 10.13 ω .0095

Res. of $Cu S_2$ in Telephone box powdered + x

No extra weight	~~7.5 ω~~ 6.5
10 gr.	1.5
20 "	1.0 ω
50 ω	.77
100	.46

Electr. deflections

1 Agbl $\begin{cases} 39.35 \\ 60.6 \end{cases}$ 10.65

2 $\begin{cases} 28.2 \\ 70.85 \end{cases}$ 21.8

Throw of needle 1 cell $\begin{cases} 36.5 \\ 64.5 \end{cases}$

Res. of $Cu S_2$ in powder after heating same

no weight	nearly ∞
10 grs	9
no weigh	15,000 ω
10 grs	140 "
no weight	300,000
10 grs	160
20 grs	133
no weight	123